CLAIMS

1. A group III-nitride-based compound semiconductor device, comprising:

a first p-layer and a second p-layer, to each of which an acceptor impurity is added; and

an intermediate layer provided between the first p-layer and the second p-layer,

wherein the intermediate layer is doped with a donor impurity of such a concentration that a hole generated by an acceptor impurity inadvertently introduced into the intermediate layer during its manufacturing process is substantially compensated.

2. The group III-nitride-based compound semiconductor device according to claim 1, wherein:

the donor impurity doped into the intermediate layer is doped with a concentration distribution corresponding to a concentration distribution of the acceptor impurity in the intermediate layer.

3. The group III-nitride-based compound semiconductor device according to claim 1, wherein:

the acceptor impurity is magnesium and the donor impurity is silicon.

4. The group III-nitride-based compound semiconductor device according to claim 3, wherein:

the donor impurity of silicon has a concentration distribution substantially 1/10 that of the acceptor impurity of magnesium.

5. The group III-nitride-based compound semiconductor device according to claim 1, wherein:

the intermediate layer has a hole concentration equal to or less than $10^{17}/cm^3$.

6. The group III-nitride-based compound semiconductor device according to claim 1, wherein:

the first p-layer includes a p-cladding layer made of p-type AlGaN doped with Mg, and the second p-layer includes a p-contact layer made of p-type GaN doped with Mg.

7. A group III-nitride-based compound semiconductor device, comprising:

a sapphire substrate;

an n-contact layer formed on the sapphire substrate;

an n-cladding layer formed on the n-contact layer;

a light emitting layer formed on the n-cladding layer;

a p-cladding layer and a p-contact layer, to each of which an acceptor impurity is added;

an intermediate layer provided between the p-cladding layer and the p-contact layer,

a thin film p-electrode disposed on the p-contact layer;

a thick film p-electrode disposed on the thin film p-electrode; and

an n-electrode disposed on the n-contact layer,

wherein the intermediate layer is doped with a donor impurity in a concentration, by which holes generated by an acceptor impurity introduced therein during a manufacturing process are substantially compensated.

8. The group III-nitride-based compound semiconductor device according to claim 7, wherein:

the light emitting layer includes a multiquantum well structure formed on the n-cladding layer by laminating multiple pairs of well layers of undoped InGaN and barrier layers of undoped GaN.

9. The group III-nitride-based compound semiconductor device according to claim 7, wherein:

the thin film p-electrode is formed of a first layer of cobalt and a second layer of gold;

the thick film p-electrode is formed by laminating a first layer of vanadium, a second layer of gold, and a third layer of aluminum in sequence, on the thin film p-electrode; and

the n-electrode is formed by laminating a first layer of vanadium and a second layer of aluminum on a partly exposed portion of the n-contact layer.

10. The group III-nitride-based compound semiconductor device according to claim 7, further comprising:

a reflective metal layer of aluminum formed on the lower surface of the sapphire substrate.